REMARKS

This Amendment is in response to the Final Office Action dated September 10, 2003, and is requested to be entered in connection with an RCE filed on December 10, 2003. Previous to the current amendments, Claims 1-35 and 52-55 stood rejected. Claims, 1, 2, 4, 5, 7, 10, 12, 15, 17, 18, 21, 23, 26, 29, and 52 have been amended herein. Claims 56 and 57 have been added. Claims 1-35 and 52-57 are now pending. In view of the foregoing claim amendments and the following remarks, Applicant respectfully requests reconsideration and allowance of all pending claims.

Argument in Support of Patentability of Amended Independent Claims

Claim Rejections – 35 U.S.C. § 102

Prior to the current amendments, claims 1-3 and 52-54 stood rejected under 35 U.S.C. § 102(a) as being anticipated by U.S. Patent No. 6,363,097 (hereinafter Linke). Applicant respectfully asserts amended claim 1 is clearly patentable over Linke.

To establish prima facie anticipation of a claimed invention, all the claim limitations must be taught by the prior art. Applicant respectfully submits that Linke fails to teach or suggest all of the claim limitations of the rejected claims. For example, claim 1 recites in pertinent part:

> A method ..., comprising:
>
> ...
>
> "forming a portion of the intracavity waveguide segment to effect a negative thermo-optic refraction index coefficient such that an effective round trip optical path length of the resonant cavity is substantially athermal." (emphasis added).

Applicant respectfully asserts that Linke in no way teaches or suggests "forming a portion of the intracavity waveguide segment to effect a negative thermo-optic refraction index coefficient such that an effective round trip optical path length of the resonant cavity is substantially athermal" as recited in amended claim 1.

Support for the foregoing amendment is found in the application specification and discussed with reference to the drawing figures. For example, a discussion of non-limiting embodiments that provide athermal resonant cavities follow the heading "Athermal Cavity" on page 10. Included in this discussion is the statement, "In another aspect of the invention, a region of thermo-optical polymer may be incorporated within the laser resonator wherein the negative thermo-optic [refractive index] coefficient is exploited to produce an athermal free spectral range," and the statement "Note that the material used need not strictly be a polymer; all that is necessary is the negative thermo-optic coefficient."

As more energy is output by an optical source (e.g., a laser gain medium), the optical path components in a resonant cavity are heated. Typically, each of these components will be made of a material that has a positive thermo-optic refractive index coefficient – that is, their refractive index increases with an increase in temperature. In contrast, the portion of the intracavity waveguide segment with the negative thermo-optic refractive index coefficient reduces its index of refraction when heated. If the parameters of the various optical path components are properly configured, (e.g., in accordance with equation 5 on page 10), the effective round trip optical path length of the resonant cavity (and thus the FSR of the laser) can be made athermal, that is independent of the device temperature (substantially).

It is clear that the Linke laser provides anything but athermal operation. As stated in the abstract, cooling is imparted to reduce the temperature of a

grating written in a photorefractive material to a point at which most of the doped impurities form DX centers. The grating can be erased by heating the photorefractive material to a temperature at which most DX centers are ionized, which erases the grating. The laser diode is maintained and operated at a low temperature to maintain the grating semi-permanently. Clearly, the Linke laser is incapable of performing high-power operations, and there would be no need to account for variances in temperature, since this would render the Linke laser inoperable.

Amended independent claim 17 contains a similar recitation of "forming a portion of the intracavity waveguide segment to effect a negative thermo-optic refraction index coefficient such that an effective round trip optical path length of the resonant cavity is substantially athermal" and, thus, claim 17 and dependent claims 18 and 19 are not anticipated by Linke for at least the same reasons that claim 1 is not anticipated.

Amended independent claim 52 contains a similar recitation of "forming a portion of the intracavity waveguide segment to effect a negative thermo-optic refraction index coefficient such that an effective round trip optical path length of the resonant cavity is substantially athermal" and, thus, claim 52 and dependent claims 53 and 54 are not anticipated by Linke for at least the same reasons that claim 1 is not anticipated.

Claim Rejections – 35 U.S.C. § 103

Prior to the present amendment, Claims 4-16, 20-35 and 55 stood rejected under 35 U.S.C. § 103(a) as being unpatentable over Linke in view of U.S. Patent No. 6,167,169 (hereinafter Brinkman). To traverse a potential rejection of the foregoing amended independent claims 1, 17, and 52, applicant now argues

why each of amended independent claims are patentable over Linke in view of Brinkman.

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art (M.P.E.P. § 2143.03 citing *In re Royka,* 490 F.2d 981 (CCPA. 1974)). Applicant respectfully submits that the combination of Linke and Brinkman fail to teach or suggest all of the claim limitations of the rejected claims.

The office action acknowledges that Linke fails to disclose the type of material used for the waveguide segment. The office action then cites Brinkman as disclosing polymer materials to overcome the acknowledged deficiency of Linke. However, this cited disclosure of polymer material by Brinkman in no way overcomes the deficiency of Linke (failure to teach or suggest forming a portion of the intracavity waveguide segment to effect a negative thermo-optic refraction index coefficient such that an effective round trip optical path length of the resonant cavity is substantially athermal). In fact, the use of the polymer material by Brinkman teaches away from this element.

Discussion of the use of a cladding in Brinkman generally spans from Col. 33 line 28 – Col. 34, line 6. In particular, a portion of this discussion recites:

> A means to enhance the tunability of a grating in a waveguide device 480 is to overlay a second electro-optic material 482 on the waveguide to form a cladding, as shown in FIG. 16. The cladding should be transparent to the wave propagating in the waveguide and it should be <u>electric field-sensitive to enable adjustable modification of its index of refraction</u>. The average effective index is determined partly by the index of refraction of the cladding. The second material may have a higher electro-optic coefficient than the substrate. Liquid crystals and polymers are good examples of materials which can be used as cladding. The index of the cladding is preferably close to that of the guiding region so that a large portion of the guided beam propagates in the cladding. ... (Emphasis Added) (Col 33, lines 28-41)

It is clear that the cladding material in Brinkman is not selected based on an ability to change its index of refraction via a thermo-optic effect, and that certainly there is no teaching or suggestion that the cladding material has a negative thermo-optic refraction index coefficient. Furthermore, the use of the cladding material is for tuning purposes, that is, to change the center wavelength of the grating. This requires an active control input (electrical, not thermal), and is not passive. In contrast, the athermal resonant cavities formed by the methods of claims 1, 17, and 52 achieve their athermal characteristic in a passive manner, that is, they do not require any external input, which is intentional. Additionally, the purpose of the athermal resonant cavity is exactly the opposite of tuning – the objective is to maintain an FSR at a desired value that is maintained independent of temperature changes.

Because the cited combination of Linke and Brinkman fails to teach or suggest each and every element of claim 1, each of claim 1 and dependent claims 2-16 and 56 are not rendered obvious. For substantially similar reasons, the cited combination of references fails to teach each and every element of claims 17 and 52 and, thus, dependent claims 20-35, 57 and 55 are also patentable over the cited combination.

CONCLUSION

In light of the foregoing remarks, all pending claims are believed to be in condition for allowance. Accordingly, a Notice of Allowance is respectfully requested. If the Examiner has any questions or comments regarding this amendment, it is respectfully requested that the Examiner contact the undersigned at (206) 292-8600.

Respectfully submitted,

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Date: Jan 8, 2004

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